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Livestock Update

Beef - Horse - Poultry - Sheep - Swine

October 2014

This LIVESTOCK UPDATE contains timely subject matter on beef cattle, horses, poultry, sheep, swine, and related junior work. Use this material as you see fit for local newspapers, radio programs, newsletters, and for the formulation of recommendations.

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Scott P. Greiner, Extension Project Leader
Department of Animal & Poultry Sciences

Dates to Remember

BEEF

DECEMBER

13 Culpeper Senior Bull Sale. Culpeper Agricultural Enterprises. Culpeper. Sale: 12:00 Noon. ***Contact***: Scott Greiner (540) 231-9159; email: sgreiner@vt.edu

SHEEP

DECEMBER

6 Annual Virginia Fall Bred Ewe & Doe Sale. 1:00 P.M. Rockingham County Fairgrounds. Harrisonburg. ***Contact***: Scott Greiner (540) 231-9159; email: sgreiner@vt.edu

JANUARY

10 Shepherd's Symposium. Augusta County Government Center. Verona. ***Contact***: Scott Greiner (540) 231-9159; email: sgreiner@vt.edu

November Herd Management Advisor

Scott P. Greiner & Mark A. McCann
Extension Beef Specialists, Virginia Tech

Moisture in our region through early fall has been ahead of normal resulting in improved fall pasture growth and quality. With some additional management and effort this extra pasture growth can be translated into extra grazing days and reduced hay feeding. Research and Extension demonstrations have consistently shown that strip/ limit grazing of this accumulated fall growth is a far more efficient means of utilization as compared to continuous grazing. Producers who have utilized strip grazing do not have to be convinced to implement it again, as they have witnessed the efficiency of utilization along with positive changes in cattle behavior. In fact, many add more frequent moves of temporary fencing to improve harvest efficiency in succeeding years. Be aware that fall calving cows have higher nutritional requirements, and thus are better candidates for stockpiled fescue grazing, compared to spring calving cows which are in mid-gestation. If you worry that you are pushing the cows too hard to cleanup stockpiled forage, put out a bale of average to below quality hay in the grazed area. If cows consume the hay too quickly, then move the fence and provide access to more forage on more frequent basis. One last item to recall about limit grazing tall fescue is that once it is consumed, the pasture area is prepared for frost seeding of clover.

Spring Calving Herds (January-March)

General

- Implement marketing plan for calf crop, synchronize post-weaning grazing and feeding program as well as vaccination program with marketing plan. Calculate break-evens on various winter and spring marketing options and consider risk management strategies.
- Schedule and conduct pregnancy diagnosis with veterinarian. Plan a marketing strategy for open cows which takes advantage of seasonality in cull cow price.
- Finalize winter feed and forage supplies and options. Conduct forage tests to determine nutritional content of hays.

Nutrition and Forages

- Body Condition Score cows at weaning and separate thin cows
- Use palatable feeds and high quality hay to background calves.
- Continue stockpiling tall fescue and begin strip grazing accumulated growth if needed.
- Continue to manage first-calf heifers separately; give them the best forage. Thin mature cows could be added to this group.
- Continue to feed high Se trace mineral salt. A forage analysis can reveal what other minerals should be supplemented.
- As warm season grasses go dormant, manage grazing to utilize dormant residue before too much weathering occurs.
- Begin to shop and compare winter supplement options.

Herd Health

- In consultation with your veterinarian, finalize vaccination and preconditioning protocol for calf crop.

Reproduction

- Conduct pregnancy check of cow herd with veterinarian.
- Cull open, old and thin cows and cows with problem udders, eyes and soundness issues.

Genetics

- Collect weaning weights on calf crop at appropriate time (AHIR age range 120-280 days), along with cow weights, hip heights and body condition scores (cow mature size data taken within 45 days of calf weaning measure).
- Identify replacement heifers using objective measures including genetic background, dam performance, individual performance, along with phenotype. Keep only heifers born in defined calving season.

Fall Calving Herds (September-November)

General

- Calving season is winding down for most. Continue to observe cows frequently. Address calving difficulties early.
- Tag, tattoo, record birth weight, calving ease score, teat/udder score and mothering ability of dam. Keep accurate records at birth.
- Monitor young calves for scours. Prevent scours by keeping calving area clean and well drained. Moving 2-3 day old pairs out of calving area to separate pasture (reduce commingling of newborn calves with older calves) help reduce exposure to scours.
- Finalize winter feed and forage supplies and options. Conduct forage tests to determine nutritional content of hays.
- Finalize plans and schedule for breeding season.

Nutrition and Forages

- Evaluate growth of yearling heifers with goal of reaching 60-65% of mature weight by breeding. Depending on forage quality, supplementation maybe needed to meet weight gain target.
- Offer high magnesium mineral. Generally, fall calving cows are not as predisposed to grass tetany.
- Reserve high quality hay and stockpiled pasture areas for cows post-calving. Use strip grazing as a tool to increase the efficiency of utilization of cool season pastures by cows post-calving.
- If available, utilize crop aftermath.
- Use grazing management to utilize the residue of dormant warm season pastures.

Herd Health

- Ensure colostrum intake first few hours of life in newborn calves. Supplement if necessary. Newborn calves need 10% of body weight in colostrum first 24 hours of life.
- Provide selenium and vitamin A & D injections to newborn calves
- Castrate commercial calves at birth
- Monitor calves closely for scours and pneumonia, have treatment supplies on hand.
- Finalize and conduct pre-breeding vaccination schedule for cow herd and yearling heifers. Plan early to allow 30-day vaccination window prior to breeding season.

Reproduction

- Reproductive tract score and measure pelvic area on yearling replacement heifers.
- Finalize plans and protocols for breeding season. Establish calendar to map timing of synchronization program to be used during breeding season. Confirm schedule with AI technician, have supplies and semen are on hand.
- Breed heifers 2-4 weeks ahead of mature cows to allow longer post-partum interval prior to second breeding season
- Conduct breeding soundness exams on herd sires, including annual vaccinations. Do so prior to fall/early winter bull sales to allow time to secure replacements as necessary.
- Breed heifers 2-4 weeks ahead of mature cows to allow longer post-partum interval prior to second breeding season.
- Manage newly acquired herd sires properly to prepare them for the breeding season. Yearling bulls often lose 100+ pounds during their first breeding season. Adjust them to the feed and environment of their new home, and commingle bulls of same age/weight for a period of time prior to turnout. Ample exercise, in combination with a proper nutritional program, is essential to make them physically fit for the breeding season

Genetics

- Collect yearling performance data (weight, height, scrotal, ultrasound) in seedstock herds.
- Make plans for spring bull-buying season. Evaluate potential sources for bull purchase. Using herd genetic goals, establish benchmarks and selection criteria for bulls to be purchased. Secure new natural service sires in ample time to acclimate to your management and environment prior to breeding season.

Evaluate Nutrition Needs and Plan for Winter

Dr. Mark A. McCann
Extension Animal Scientist, Virginia Tech

Depending on your location in the state, forage conditions and hay inventories vary a great deal. Weather conditions ranged from too wet to make hay to too dry to grow it. Add to that variable fall moisture resulting in a wide range of stockpiled forage. Dry matter needs of the herd can be met with the sum total of stockpiled fescue and stored forages. Fall calving cows need the quality of stockpiled forages while spring calving cows can get by on average hay supplemented with stockpiled forage. The effort and expense in strip grazing stockpiled forage is justified by stretching the number of days that the valuable resource is available and by supplying cows a more consistent level of nutrition. Without rationing, available forage quality will decline as the herd spends more time on the stockpiled pasture.

On the stored forage side of the equation, hay amounts and quality are quite varied. The current economic environment of record calf prices and affordable feed emphasize the importance managing the nutrition program to minimize calf loss and maximize pregnancy rate. More than ever forage testing will be important to insure that the supplementation program meets nutrition requirements.

Table 1 contains the estimated total dry matter needs of a 1200 lb cow over varying winter periods. The dry matter requirement was set at 2% of body weight for ease of comparison. Hay quality and cow stage of production will impact dry matter intake. Consumption of average quality hay is less than high quality hay and lactating cows will consume more than dry cows. The dry matter requirement is also adjusted to an as-fed (86% DM) value to reflect actual hay needs. Finally, storage and feeding waste is estimated to average 30%, the larger hay requirement listed should be of the greatest interest since it denotes the actual amount of hay to be produced or purchased to meet cow needs and allow for storage/feeding loss.

Table 1. Tons of hay needed per 1200 lb cow for varying feeding periods

	Days of Hay Feeding			
1200 lb cow	60	90	120	150
Dry Matter basis (24 lb/cow)	.72	1.1	1.4	1.8
As-Fed basis (28 lb/cow)	.84	1.3	1.7	2.1
As-Fed Basis (w/30% hay waste)	1.2	1.8	2.4	3.0

Costs displayed in Table 2 are based on the hay value of $110/ton for grass or mixed hay. Expected hay costs are presented with and without 30% storage/feeding loss. These loss or waste percentages vary a good bit by farm and other factors, but 30% is a conservative estimate unless bales are stored in a building or under a hay tarp. Bale losses can reach and pass 50% under the worst conditions of weather, bale density, time exposed and a poor feeding system.

Table 2. Hay costs on a per cow basis with or without hay storage and feeding loss.

	Days of Hay Feeding			
	60	90	120	150
Hay consumed basis	$92	$143	$187	$231
Hay consumed + waste basis	$132	$198	$264	$330

The way to take advantage of producing high quality hay is to know it and modify your feeding program accordingly. This is where forage testing can provide the answers you need. Correctly matching hay quality and cow needs is the most efficient and least costly method of feeding cows through the winter. Without forage analysis, many times additional feed is provided needlessly or inadequate supplementation is provided. Both have negative economic impacts.

For such a small part of the year, winter nutrition programs can have a dramatic impact on annual cow costs and revenues. Grazing management of stockpiled fescue in the fall and storage of round bales can reduce the costs of a winter forage program. Be aware that the recent large shifts in other input costs (fuel, fertilizer, equipment, etc.) have made large changes in hay costs and potential value. As with all economic evaluations, the inclusion of individual cost data into an enterprise budget will add more accuracy and validity to the financial conclusions.

2014 Culpeper Senior Bull Sale

Dr. Scott P. Greiner
Extension Animal Scientist, Virginia Tech

The 57th annual sale of the Virginia BCIA Culpeper Senior bulls will feature approximately 60 fall-born yearling bulls on Saturday, December 13, 2014 at 12:00 noon at the Culpeper Agricultural Enterprises located on Route 29 just south of Culpeper, Virginia. These 60 fall-born bulls represent the top end of the 97 Angus, SimmAngus, and Braunvieh Hybrid bulls currently being developed.

The majority of the bulls selling are sired by trait-leading, highly proven AI bulls of each breed. All bulls selling meet minimum genetic requirements (EPDs) to sire calves for the VQA Purple Tag Feeder Calf Program. Bulls have been screened for reproductive and structural soundness, and sell with the BCIA enhanced guarantee for soundness and fertility. Complete performance information will be available on all bulls, including growth, maternal, and carcass EPDs, detailed test performance information, and ultrasound data. Many of the bulls will sell with genomically-enhanced EPDs, and all SimmAngus bulls will be genotyped for homozygous black status.

Again this year, we will feature video clips of each of the bulls available for sale. These video clips provide buyers a good opportunity to preview the bulls prior to sale day, and can be found on the BCIA website www.bcia.apsc.vt.edu . Virginia BCIA would like to thank Southern States and Mike Shanahan of Shanahan Cattle Promotions for their support of the video feature.

As a new sale feature for 2014, the sale will be available via the internet through DV Auction at www.dvauction.com . Producers will be able to view and purchase bulls over the internet with live streaming video in conjunction with the sale.

For video clips as well as catalogs and detailed information on the bulls visit the website www.bcia.apsc.vt.edu, or phone Virginia BCIA at 540-231-9159 or Glenmary Farm at 540-672-7396.

Tax and Financial Management in Profitable Years

Posted on August 6, 2014 by Gordon Groover
Peter Callan, Extension Agent, Farm Business Management, Northern District

In the first six months of 2014, the prices for feeder and fat cattle and milk have reached record levels. These high prices in conjunction with declining grain prices will likely result in many producers generating significant tax liabilities for 2014. The management and reinvestment of profits generated during times of high prices can impact the long term viability of the business. Based analysis of the farm's financial situation, consider paying down short and long term debt as a possible place to spend profits. After addressing the farm's debt load, plan on accumulating cash reserve equivalent to a minimum of three months' operating expenses. The next question is where the profits should be spent (e.g., Machinery, retirement accounts, etc.).

Over the years, many producers have invested in new trucks and equipment to generate depreciation on their tax returns as a means to reduce tax liabilities. Before investing in new equipment, however, producers should calculate how this equipment will **realistically** increase the profitability of their business. What is the anticipated payback for the new equipment and will this purchase reduce costs or improve efficiency that will improve the farm's bottom line?

In some areas of the Midwest, older farmers are contracting to have their crops planted by custom operators who own planters equipped with the latest GIS technology, which provides the platform for variable fertilizer and seed monitors, etc., as a way to benefit from the latest advances in technology without owning the equipment.

Historically, farmers have reinvested in their businesses with little thought of diversifying their investments into nonfarm assets. An Individual Retirement Account (IRA) is a savings plan that provides the taxpayer (farmer) with tax advantages for setting aside money for retirement and diversifies investments. There are two types of IRAs for retirement saving. Traditional IRAs are funded with before tax contributions and the Roth IRAs are funded with after-tax contributions. A taxpayer can open and make a contribution to a traditional IRA and/or a Roth IRA if the taxpayer (or if filing a joint return, their spouse) receives taxable compensation (e.g. earned income – wages, salaries, commissions, self-employment income – net earnings from schedule F or C) during the year. A taxpayer whose age is more than age 70 ½ years by December 31, 2014 cannot make a contribution to a traditional IRA. On the other hand, there are no age constraints for contributions to a Roth IRA. Contributions to traditional and Roth IRAs can be made at any time during the year and up to the due date for filing a tax return for that year, not including extensions. For tax year 2014, contributions must be made by April 15, 2015.

The amount contributed to an IRA is based on the amount of taxable income received by the taxpayer during the year. In 2014, the maximum contribution for a traditional IRA and Roth IRA is the lesser of $5,500 or 100 percent earned income ($6,500 age 50 or older). For example, a farmer with $4,000 in earned income (net schedule F after depreciation) would be limited to a maximum contribution of $4,000 to an IRA. The maximum

contribution to a spousal traditional or Roth IRA (for a spouse with little or no earned income in 2014) is the lesser of $5,500 or 100 percent of combined earned income ($6,500 age 50 or older). A taxpayer may contribute 100 percent of earned income to a traditional IRA, a Roth IRA, or split between both types of IRAs up to the annual contribution limit.

The benefit of a traditional IRA is that the contributions are tax-deductible in the year that the taxpayer makes the contribution. For example, the taxable income for a couple is $95,000 in 2014 and each spouse contributes $5,500 in a traditional IRA. They will be able to deduct the contributions from their income taxes. Thus they will pay tax on $84,000 in income to the IRS. Assuming that the couple is in the 25 percent marginal tax bracket (Federal) and their IRA contributions are $11,000, they will save $2,750 in Federal income taxes in 2014. The earnings generated by a traditional IRA are tax-deferred. The tax deductible contributions and earnings are taxable as ordinary income when they are withdrawn from the account after age 59 ½. The IRS will assess a 10 percent early withdrawal penalty for distributions made before the farmer reaches age 59 ½ from the IRA.

Another strategy to reduce taxable income is for the sole proprietor farm owner to pay children who work on the farm wages at rates equivalent to those paid to other employees performing the same tasks.

Internal Revenue Service (IRS) states “Payments for the services of your child under age 18 who works for you in your trade or business (including a farm) are not subject to social security and Medicare taxes.” This ruling applies only to farms operated as sole proprietorships.

The tax law is different for business entities. IRS Publication 225 states:

“Payments for the services of your child or spouse are subject to federal income tax withholding as well as social security, Medicare, and FUTA (Federal Unemployment) taxes if he or she works for any of the following entities.

- A corporation, even if it is controlled by you.
- A partnership, even if you are a partner. This does not apply to wages paid to your child if each partner is a parent of the child.
- An estate or trust, even if it is the estate of a deceased parent.

In these situations, the child or spouse is considered to work for the corporation, partnership, or estate, not you.”

By paying children wages at rates that are comparable to rates paid to non family members for similar tasks and responsibilities, the farm owner can shift income to their children who will be in lower tax brackets. Thus, over several years the children will be able to accumulate “significant” nest eggs that can be used to pay for college expenses.

Finally, retirement plans for farm employees provide another means to reduce a farm's taxable income. Based on my previous work experience, few farms provide retirement programs for their employees. Today, there is intense competition to hire and retain key employees who are in management positions on farms. Providing retirement plans for employees is a tax deductible fringe benefit to help retain employees. It is a way for the farm owner to pay for longevity and share the profits in a business. There are a number of different types of retirement programs that can be implemented by a farm owner. It is recommended that farm owners talk with an investment advisor on setting up a retirement plan that best meets their needs.

The strategic investment of profits generated from recent record cattle and milk prices will lay the foundation for the long term viability of cattle and dairy producers. By working together with their lenders, accountants, and, investment advisors, producers can develop a plan to prioritize the investment of profits into the farm's infrastructure that will maximize returns to their land, labor and capital in the cyclical beef and dairy industries, as well as preserve and grow hard earned profits for their retirement years.

Sheep Management Tips- Late Fall

Dr. Scott P. Greiner
Extension Animal Scientist, Virginia Tech

Breeding to 6 Weeks Before Lambing

1. Mature ewes in average to good body condition should be fed to maintain or slightly increase their bodyweight during the first 3 ½ months of gestation. This is the time to take advantage of stockpiled forages in late fall. If this period occurs during the winter, hay will normally supply the necessary nutrients, with no supplemental grain required.
2. Thin ewes should be fed separately and supplemented with 1 to 1.5 lbs of grain per day to gain 10 to 15 lbs by 6 weeks before lambing.
3. Pregnant ewe lambs should be fed separately from mature ewes. They should gain approximately 25 lbs from breeding to 6 weeks before lambing. Attempts to cause large weight gains in ewe lambs during late gestation may lead to lambing problems. Conversely, underweight ewe lambs and/or poor body condition have low birth weight lambs and poor survivability and lower milk production.
4. If pregnant ewes are to be brought into the flock, keep these ewes separate from the main flock through lambing when feasible. This will diminish the risk of introducing abortion and other diseases into the main flock. Consult with your veterinarian regarding health management protocols for these newly received ewes.
5. Shear ewes if facilities are available to shelter ewes appropriately during winter months.

6 Weeks Before Lambing

1. Start feeding 0.5 lb of grain per head daily as a preventative for pregnancy disease. Grain may be in the form of whole shelled corn or barley. Even if ewes are on good quality pasture, they still require the extra grain. During the winter or when on poor quality pasture, feed approximately 4 lbs of hay in addition to grain.
2. Administration of antibiotics pre-lambing has been shown to reduce the incidence of abortions. Consult with your veterinarian on a flock health management protocol.
3. Make sure there is plenty of feed trough space so that ewes do not crowd each other at feeding time.

4 Weeks Before Lambing

1. Shear the wool from around the head, udder and dock of pregnant ewes. If covered facilities are available, shear the ewes completely. Sheared ewes are more apt to lamb inside, facilities stay drier because less moisture is carried in by the ewes, sheared ewes require less space, and environment is cleaner for newborn lambs and the shepherd. Sheared ewes must have access to a barn during cold, freezing rains, and they must receive additional feed during periods of extremely cold temperatures.
2. Vaccinate ewes for overeating disease and tetanus. These vaccines provide passive immunity to baby lambs through the ewes' colostrum until the lambs can be vaccinated at 4 to 6 weeks of age.
3. Check and separate all ewes that are developing udders or are showing signs of lambing. Check and remove heavy ewes once a week during the lambing season. Increase the grain on all ewes showing signs of lambing to 1 lb daily, and feed all the good quality grass/legume hay they will clean up.

4. Observe ewes closely. Ewes that are sluggish or hang back at feeding may be showing early signs of pregnancy disease. If so, these ewes should be drenched with 2 ounces of propylene glycol 3 to 4 times daily.
5. Shelter ewes from bad weather.
6. Get lambing pens and lambing equipment ready. There should be one lambing pen for every ten ewes expected to lamb.
7. Stock lambing supplies such as iodine, antibiotics, frozen colostrum, stomach tube, injectable selenium and Vitamin E, OB lube, lamb puller, ear tags, etc.

Sheep Update

Dr. Scott P. Greiner
Extension Animal Scientist, Virginia Tech

Annual Virginia Fall Bred Ewe & Doe Sale to be Held December 7

The 2014 Virginia Sheep Producer's Association Fall Bred Ewe & Doe Sale will be held Saturday, December 6 at 1:00 PM at the Rockingham County Fairgrounds in Harrisonburg. Yearling ewes and does, ewe lambs and doe kids, along with mature ewes and does will be sold. All yearling and mature ewes and does will be sold as guaranteed pregnant. Breeds offered will include Suffolk, Hampshire, Dorset, and crossbreds (including wether dams). All does will be registered meat goats or meat goat crossbreds. For a sale catalog or more information visit the VSPA website http://www.vasheepproducers.com/ .

Shepherd's Symposium scheduled for January 10, 2015

The annual Shepherd's Symposium will be held Saturday, January 10, 2015 at the Augusta County Government Center in Verona, VA. The one-day program will include educational sessions with a variety of production, management, and marketing topics. A lamb lunch will be included. On Friday evening, January 9, open meetings of the Virginia Sheep Producers Association and the Virginia Sheep Industry Council will be hosted. Program details and registration materials will be available by mid-November. For more information, contact Scott Greiner at 540-231-9159 or sgreiner@vt.edu or visit Virginia Tech Sheep Extension http://www.apsc.vt.edu/extension/sheep/index.html.

Methods for Improving Pre-Weaning Survival Rates of Piglets: I. Management of the Sow Prior to Farrowing

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INTRODUCTION

Knauer and Hostetler (2013) concluded that sow productivity in the U.S. increased between 2005 and 2010 as a consequence primarily of improved management and genetics. The researchers examined data representing annual production by approximately 1.8 million sows, and reported increases in total litter size and pigs born live. Although the number of pigs weaned increased as well, the percentage of pigs that died before weaning was relatively constant between 2005 and 2009, and actually increased from 2009 to 2010 (Figure 1). Those data do not represent all pig farms in the U.S. and as such may or may not be applicable to many small-scale and niche market operations. They do suggest, however, that there is potential for further increasing sow productivity by decreasing pre-weaning mortality.

Pre-weaning mortality in piglets may be interpreted as a welfare concern, and certainly represents a large economic loss for the producer. In fact, some estimates place the average value of each newborn piglet at just under $25 (Lay *et al.*, 2002), although this may vary greatly according to breed, season, input costs, and current market prices. Producers with high pre-weaning mortality wean fewer pigs per sow per year and miss the opportunity to capitalize on good breeding herd performance (e.g., high farrowing rates, large litter sizes, etc.). Maximizing *pre-weaning survivability*, which is the percentage of piglets born alive that survive to weaning, then becomes one of the most important production goals of the sow farm.

This paper is the first in a three paper series addressing methods for improving piglet pre-weaning survival rates. Specifically, this article will focus on sow management strategies that may be employed at breeding and throughout pregnancy to improve piglet health, well-being, and survivability.

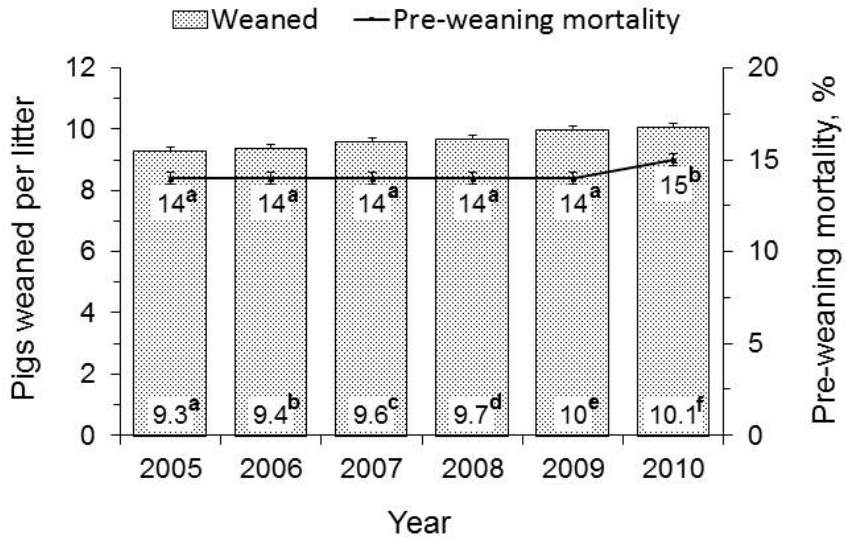

Figure 1. Number of pigs weaned per litter and percent pre-weaning mortality for sows in the U.S. between 2005 and 2010 (adapted from Knauer and Hostetler, 2013). Data represents production from approximately 1.8 million sows. For number weaned and pre-weaning mortality, values with different superscripts (a, b, c, d, e, and f) are significantly different ($P < 0.05$).

CAUSES OF PRE-WEANING PIGLET DEATHS

Most piglet deaths occur within the first 72 hours after farrowing and low survival rates are particularly common for low birth weight pigs (runts). Presented in no particular order, the major causes of death in baby pigs are: starvation, hypothermia, disease, *dystocia* (difficult, impeded, or abnormal birthing), *congenital defects* (abnormalities that exist at birth and often before birth), and crushing or overlay by the sow. Further contributing to these causes are restless sow behavior, extended farrowing length, large litter size, and birth in the latter half of farrowing. The causes of death may be interlinked. For example, piglets suffering hypothermia or starvation are more likely to huddle close to the sow, thereby increasing the chances of accidental crushing by the sow. Because it is nearly impossible to identify one cause as more responsible than any other, appropriate management practices should address all potential causes equally.

Unfortunately, some piglet mortality is unavoidable. However, dedication to appropriate management strategies can drastically improve the number of piglets that survive to weaning. Average pre-weaning survivability on commercial farms has been cited at approximately 85% (Baxter and Edwards, 2013; Knauer and Hostetler, 2013), but is estimated to be 90% or higher on small-scale operations (NAHMS, 2012), likely due to less selection pressure for litter size on small farms. Producers should strive to achieve a pre-weaning survivability of 95%. A pre-weaning survivability of 80% or less should communicate an immediate need to identify and rectify the causes of increased mortality.

IMPROVING PIGLET SURVIVAL THROUGH SOW MANAGEMENT

Genetic Considerations

Reproductive performance exhibited by livestock is influenced by both genetic and environmental factors. *Heritability* of a trait refers to the percentage of total trait variation (genetic and environmental) that is due solely to genetics. The heritability estimates for number of pigs weaned (7%) and survival to weaning (5%) are low, meaning these traits are affected primarily by environmental factors. Genetic improvement in a herd is slow when *selection decisions* (determining which pigs on a farm will produce the next generation) are based on lowly heritable traits, such as number of pigs weaned. Interestingly, selection for litter size at day five post-farrowing correlates highly with piglet survival and may be an appropriate means of increasing the number of pigs weaned per sow per year through selection (Su *et al.*, 2007). The number of pigs alive on day five post-farrowing is an easily recorded statistic on the small-scale pig farm and could serve as a valuable tool for assigning matings or justifying culling criteria.

Heterosis, also known as *hybrid vigor*, is defined as the biological phenomenon which causes a crossbred animal to out produce the purebred parents of the crossbred animal. For example, survival rate from birth to weaning was reported as 4.5% greater for pigs from crossbred gilts compared to pigs from purebred gilts (Johnson and Omtvedt, 1975) (Table 1). Furthermore, no single breed or cross excels in all desirable traits. *Complementary* refers to the manner, by which two or more breeds "complement" each other, thereby maximizing desirable traits and minimizing undesirable traits. **Diversifying the genetic background of the breeding herd by crossbreeding may prove advantageous for small-scale pork producers.** Further, farms committed to raising purebred lines should anticipate greater time and labor requirements needed to maintain high pre-weaning survivability.

Table 1. Example of survivability of pigs in litters farrowed by purebred or crossbred gilts (from Johnson and Omtvedt, 1975).

Characteristics of Gilt		Characteristics of Boar		Survivability of litter
Type	**Breeding**	**Type**	**Breeding**	**to weaning, %**
Purebred	Duroc	Purebred	Yorkshire	81.0
Purebred	Hampshire	Purebred	Yorkshire	74.5
Crossbred	Duroc x Hampshire[1]	Purebred	Yorkshire	83.9
Crossbred	Hampshire x Duroc[1]	Purebred	Yorkshire	87.1

[1]For crosses, first breed listed is sire breed and second breed listed is breeding of the dam.

Gilt Selection

Emphasize underline quality when selecting replacement gilts for inclusion in the breeding herd. Poor formed and placed teats force competition within the litter and increases piglet mortality. Replacement gilts should ideally have seven well-spaced functional nipples on each side.

Replacement gilts should be at least seven months of age and weigh 300 lbs. at breeding. Small and underdeveloped gilts at breeding generally remain small and underdeveloped at farrowing and are

more likely to suffer dystocia due to difficulty passing large piglets through their narrow pelvic canal. These piglets may die of suffocation immediately or suffer from *hypoxia* (oxygen deprivation) and physical injuries that contribute to death after birth. **It is recommended that replacement gilts be kept on *ad libitum* feeding *(*free choice *or* full feed) for as long as is necessary to reach the target breeding weight and to ensure that they are physically capable of farrowing and raising large litters of healthy pigs.**

Boars from terminal breeds such as Duroc, Hampshire, and Pietran, generally produce large birth weight offspring. It is important to remember that breeding young gilts to young boars does not guarantee small birth weight piglets and farrowing ease, nor will breeding young gilts to old boars guarantee heavy birth weight pigs and dystocia.

Impact of Maternal Stress

Stress experienced by gilts and sows during pregnancy creates lasting effects on the dam and fetuses and negatively impact offspring health, performance, and survivability. Producers should strive to eliminate all unnecessary stressors during pregnancy such as trucking, restraint, or pen mixing, to promote healthy *in utero* piglet development and post-natal survivability. One of the sow's greatest behavioral stressors is fighting. Pigs are social animals and will fight aggressively to achieve or maintain their position in the defined social hierarchy. Mixing pens or adding new sows to an already established group disturbs this structure and forces fighting behavior. Fighting during early pregnancy may cause embryonic death or whole-litter abortion. During the second and third trimester, fighting may cause gilts to farrow piglets that are less active, less vocal, and that experience abnormal behavioral, physiological, and immunological responses to stressful situations (Couret *et al.*, 2009; Ison *et al.*, 2010). These piglets are at greater risk of succumbing to post-farrowing physical or environmental stressors.

Sows that are untrusting or nervous when the farmer is present may display a protracted farrowing process, produce less milk, nurse fewer pigs, and be less responsive to the vocalizations of distressed piglets (Janczak *et al.*, 2003). Litters born to these dams are more likely to suffer high piglet mortality. Mistrust is most likely a learned behavior that may also be linked to the genetic profile of the animal. Sow lineages that display inherent distrust of humans may be best suited for extensive farrowing systems such as those in pasture-based operations.

Pre-Farrowing Vaccinations

Vaccinating the dam prior to farrowing builds active immunity in the sow which is transferred to the piglets through *colostrum*. Colostrum is the first milk produced by mammals during lactation, and in addition to various nutrients. It contains high concentrations of antibodies and immunoglobulins that provide piglets with passive immunity. Without colostrum-derived immunological protection, piglets are defenseless against disease pathogens. More details regarding the importance of colostrum will be discussed in later papers.

Vaccinating the sow prior to farrowing allows the producer to customize the antibody protection that is passed to the piglets through colostrum. Sow vaccinations should be given to all farrowing sows, regardless of age or parity. Examples of vaccinations that may be given at this time include: *Clostridium perfringens, E. coli,* Atrophic Rhinitis, and Erysipelas. Consult the herd veterinarian to design a customized vaccination protocol specific to the disease concerns on your farm.

Feeding the Pregnant Sow

Great care should be taken to keep the sow in good body condition throughout pregnancy. On a five-point body condition scale, sows should be maintained at a "3" (Figure 2). Thin sows do not have the protein or energy stores necessary to support piglet growth and development and obese sows may have greater fat deposition in the uterus and mammary, suffer more incidences of dystocia, and generally display higher pre-weaning death loss. Over conditioned sows at farrowing also consume less feed during lactation than medium-conditioned or thin sows (Estienne *et al*., 2000).

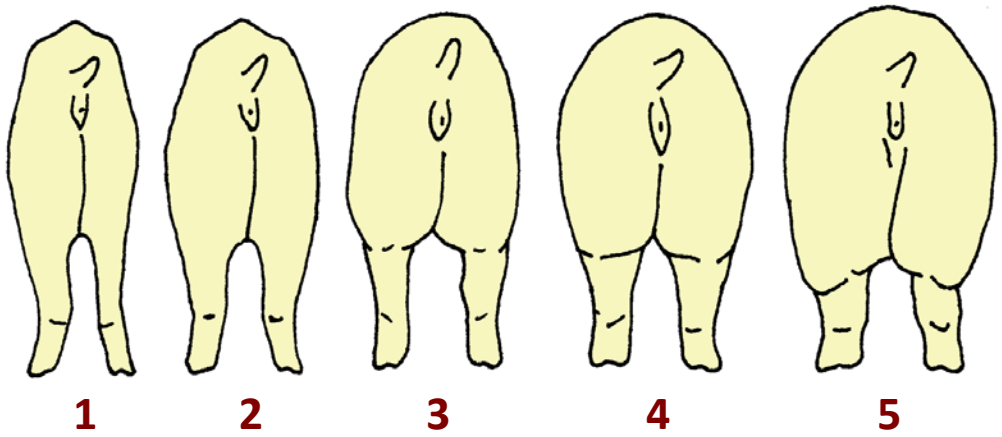

Figure 2. Body condition scale for sows (taken from PQA-Plus, Version 2.0; National Pork Board, Des Moines, IA, 2013). 1 = emaciated, 2 = thin, 3 = Ideal, 4 = fat, and 5 = overly fat. Body condition is a key indicator of management and animal well-being and farmers should strive to maintain sows with a body condition score of "3".

Sows should be limit fed according to their *maintenance requirements*; that is, the amount of feed required to support normal sow metabolism and piglet development while preventing obesity. Generally, maintenance feed intake should be limited to 4 to 6 lbs. per day, although it is best to customize feeding protocols for each individual sow according to size, age, and condition. Gilts should gain just over 100 lbs. body weight during gestation, while sows may gain anywhere from 100 to 200 lbs. of body weight. Most of this growth is in the form of fetuses, placentae, and associated fluids.

Increasing daily feed intake by as much as 50% beginning on day 90 of pregnancy helps the sow adjust to the nutritional demands of lactation, by physically stretching the stomach and preparing the metabolism for greater feed intake and nutrient turnover. This allows the sow to produce a greater volume of high quality milk and nurse larger litters. Further, the pig fetus undergoes a surge in intrauterine growth during the last month of gestation, and providing the sow extra nutrients at this time will advance fetal musculoskeletal development and piglet survival (Okai *et al.*, 1977).

The piglet is born with very little energy reserves and, consequently, is at great risk of succumbing to hypothermia or starvation in the immediate post-farrowing period. Methods to address this

problem by modifying the sow's diet have found some success. Increasing the fat content of the late-gestation and early-lactation diet may promote *in utero* glycogen (stored glucose) and fat deposition in the fetus, as well as increase the fat content of colostrum. Further, increasing dietary fiber in the gestation diet may increase colostrum production and intake. Table 2 presents a brief review of several studies that demonstrated nutritional approaches for enhancing piglet survival. Note that low birth-weight piglets in particular benefited from the inclusion of high fat or fiber in the sow gestation and lactation diets.

Preparing the Farrowing Area

To date, there is no evidence to suggest that the method of gestation housing (i.e., gestation crates vs. group pens) influences pre-weaning survivability (Cronin *et al.*, 1996; Bates *et al.*, 2003; Harris *et al.*, 2006). Type of farrowing accommodation, however, will greatly affect pre-weaning survivability. Sows must have a designated area in which to farrow. The farrowing crate, which limits sows to standing, sitting, and lying, is widely used in the swine industry and has been shown to increase piglet survivability compared to other types of farrowing accommodations (Cronin and Smith, 1992; Blackshaw *et al.*, 1994, Cronin *et al.*, 1996). For example, Blackshaw *et al.* (1994) showed that pre-weaning survivability was greater in farrowing crates than in farrowing pens that allowed more freedom of movement (86% and 68%, respectively). To some, the enhanced welfare and increased survival of newborn piglets outweighs the potential compromise of sow welfare caused by confinement in farrowing crates. To others, especially those with animal welfare-driven production goals, the end does not justify the means, and alternative farrowing systems are desired.

Communal farrowing pens may be an appropriate option for the semi-intensive pork producer (Arey and Sancha, 1996). Communal farrowing pens, also referred to as family-style farrowing pens, typically consist of a series of adjoining farrowing pens connected to one large social gathering area. In this design, sows and their litters have privacy during farrowing and early-lactation, but are still allowed the freedom to express their natural maternal and social behaviors. However, piglet survivability, especially due to crushing, remains less compared to standard farrowing crates (Marchant *et al.*, 2000). Increasing the size of the individual pens and providing deep straw bedding may result in improving piglet survival rates.

Table 2: Effect of sow dietary fat and fiber supplementation on pre-weaning survivability

Dietary Treatment	Treatment Effect	Reference
Supplementation with 12% soy oil beginning gestation day 91 through lactation day 7	Increased survivability by 21% for piglets weighing less than 2 lbs. at birth	Azain, 1993
Substitution of 10% soybean oil for 10% coconut oil from gestation day 84 through weaning	Increased survivability by 32% for pigs weighing less than 2.4 lbs. at birth	Jean and Chiang, 1999
Increase dietary fat to 15% from gestation day 109 through weaning	Increased survivability by 10% for piglets weighing 1.5 to 2.5 lbs. at birth	Cieslak *et al.*, 1983
Supplementation with 32 to 40% pectin residue or sugar beet pulp from mating until gestation day 108	Increased piglet colostrum intake approximately by 30%	Theil *et al.*, 2014
Increase dietary fiber from 13.3% to 23.4% beginning at gestation day 106	Increased colostrum fat content from 8.3% to 10.7% Increased colostrum intake for piglets weighing less than 2 lbs. at birth Decreased piglet mortality by 8.5%	Loisel *et al.*, 2013
Supplementation with 8% beef tallow from gestation day 100 until weaning	Increased colostrum fat content from 9.6% to 13.2%	Boyd *et al.*, 1982
Supplementation with 10% corn oil from gestation day 100 until farrowing	Increased colostrum fat content from 5.6% to 6.9%	Jackson *et al.*, 1995

Although pasture farrowing is an option and may in fact be preferred by many small-scale pork producers, some degree of human involvement remains necessary to maximize piglet survivability. In general, allowing the sow to naturally construct and farrow in an isolated nest is not recommended and will likely result in large piglet death loss. Instead, free-range producers should provide their sows with farrowing huts. A farrowing hut is a small enclosure with a complete roof that is deep bedded with straw, which allows the sow to express normal maternal behavior, such as nesting and interaction with piglets. These huts are fairly easy to construct, and building plans are easily accessible online.

The amount of floor space in the farrowing hut is closely associated with piglet survivability. Researchers from Iowa State University showed that piglet survivability to weaning was 75 to 89% in farrowing huts with a floor space allowance of 37.5 ft^2 or less, but increased to 92 to 94% when floor space allowance was 42 ft^2 or greater (Honeyman and Roush, 1997). It is presumed that

greater amounts of floor space allow the sow more freedom of movement and decrease the likelihood of accidental crushing of piglets. The authors of that study also suggested that guard rails located inside the hut increase pre-weaning survival of pigs as well.

Ultimately, the quintessential farrowing system – that is, the one that works the best for every single sow, piglet, producer, and farm – does not exist. Instead, the ideal farrowing system should be interpreted as the particular system that is most in-line with an individual farm's facilities (indoor vs. outdoor), management style (intensive vs. extensive), production goals, and desired consumer market.

A short checklist to aid the producer when selecting a farrowing system design is presented below. The criteria included in this checklist represent the minimum necessary requirements and should be considered mandatory to improve piglet survivability. Note the emphasis on farrowing system hygiene, security, and accessibility.

In the ideal farrowing system design, the producer <u>MUST</u> be able to:

- Wash and clean the area free of organic material (e.g., manure or old bedding).
- Disinfect before and after every group of farrowing animals. Allow adequate time for the disinfectant to dry before move-in.
- Wash the sow with soap and warm water prior to move-in, focusing especially on her feet and underline. Treat for internal and external parasites.
- Enforce strict biosecurity protocols.
- Provide essential protection from inclement conditions.
- Regulate the immediate farrowing environment with fans, heaters, or deep straw bedding to keep the sow cool and the piglets warm.
- Provide physical protection from wild animals that would prey on piglets.
- Eliminate or deter pests such as rodents, birds, insects, stray cats, and wildlife.
- Separate the farrowing area from all non-farrowing sows and grow/finish hogs to minimize disease transfer and the potential for cannibalism.
- **Be able to easily and safely access the sow and litter at any time of the day or night.**

CONCLUSION

Improving pre-weaning survivability of piglets will undoubtedly have financial implications for the small-scale pork producer. Many of the methods for increasing piglet survival involve management of the sow before farrowing and can therefore be achieved long before the piglet is even born. These strategies, however, require careful coordination and dedication on behalf of the producer. The return on investment, though, is more pigs weaned per sow per year and, ultimately, a more productive and profitable swine farm.

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